Simpson®

INSTRUMENTS THAT STAY ACCURATE

OPERATOR'S MANUAL

SIMPSON 2865/2865G and 2866/2866G 3½-DIGIT PANEL INSTRUMENTS

WARNING

READ AND UNDERSTAND THIS MANUAL BEFORE USING THE INSTRUMENT.

Failure to understand and comply with the WARNINGS and operating instructions can result in serious or fatal injuries and/or property damage.

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SECTION I
INTRODUCTION

1.1 GENERAL

1.1.1 The Simpson 2865/2865G and 2866/2866G (hereafter referred to as the 2865 or the 2866 or the Instruments) are 3½-digit, panel-mounted instruments that provide visual indication for either DC voltage or DC current measurement. Both Instruments feature 0.1 percent accuracy using solid-state integrated circuit electronics. Models 2865 and 2866 have a red LED display; models 2865G and 2866G have a green LED display.

1.1.2 The 2865 can be used as a self-contained, panel-mounted unit, operating from either a 120, 220 or 240 volt AC, 50 to 400 Hz power source. The 2866 is designed to operate from a 5 VDC power source. Both Instruments feature solid-state, light-emitting diode (LED) displays, automatic polarity selection and indication, automatic zeroing, excellent temperature characteristics, high input resistance (for DC voltage models), fast response time and automatic out-of-range indication. These Instruments, which provide high reliability and compact design, use a Large-Scale-Integration (LSI) module for the analog-to-digital circuitry.

1.1.3 Both Instruments are especially suited for system-oriented application. The versatility of AC line or DC operation and 200 mV full range sensitivity allow each Instrument to be used as a direct replacement for an analog type instrument. This feature makes it convenient to convert existing instruments or systems from analog to digital display and at the same time improve the performance of a system.

NOTE: This Operator's Manual contains information essential to the operation of this Instrument. Therefore, it should be kept in a convenient place and used for reference as required.

WARNING

These Instruments are designed for maximum safety to the operator when mounted in a panel according to instructions contained in paragraph 1.5. They are *not* to be used unmounted or for exploratory measurements in unknown circuits.

1.2 SAFETY PRECAUTIONS

1.2.1 These Instruments do not themselves present a shock hazard, but if connected to auxiliary line-operated equipment, the auxiliary circuits must be properly grounded for safety and to prevent improper readings.

1.2.2 When connecting the 2865 to a power line circuit, make certain that the ground terminal of the PC board is connected to earth ground as shown in Table 2.

1.2.3 Do not attempt to float the input terminals at more than 250 V DC with respect to powerline (earth) ground. Doing so may damage the Instrument.

1.2.4 Before removing the power connector from the Instruments, make certain that the circuit power sources are de-energized and any capacitors are discharged.

1.3 TECHNICAL DATA

Table 1. Technical Data

(1) Full Scale Ranges:
DC Voltage:

Range	Maximum Indication	Input Resistance	Catalog Numbers 2865	2865G	2866	2866G
200 mV	±199.9 mV	100 MΩ	24500	24510	24600	24610
2 V	±1.999 V	100 MΩ	24501	24511	24601	24611
20 V	±19.99 V	10 MΩ	24502	24512	24602	24612
200 V	±199.9 V	10 MΩ	24503	24513	24603	24613

Overvoltage Protected to: 250 V, all ranges.

DC Current:

Range	Maximum Indication	Maximum Input Current	Catalog Numbers 2865	2865G	2866	2866G
20 μA	±19.99 μA	20 mA	24504	24514	24604	24614
200 μA	±199.9 μA	20 mA	24505	24515	24605	24615
2 mA	±1.999 mA	20 mA	24506	24516	24606	24616
20 mA	±19.99 mA	100 mA	24507	24517	24607	24617
200 mA	±199.9 mA	1 A	24508	24518	24608	24618

Voltage Drop: 200 mV, all ranges.

(2) Accuracy: ±(0.1% of input + 1 count) at reference conditions

(3) Temperature Coefficient: ±(0.01% of input + 0.05 count) per °C from 0° to +55 °C

(4) Sensitivity: 100 μV for 200 mV unit:
10 nA for 20 μA unit

(5) Resolution: One part in 2000

(6) Input Bias Current: 10 pA maximum at reference conditions

(7) Full Range Step Response: (to rated accuracy) Less than 800 milliseconds

(8) Normal Mode Rejection: 50 dB minimum at 60 Hz

(9) Common Mode Rejection: (with 1 kΩ unbalance at 60 Hz) 90 dB minimum (2865 only)

(10) Rated Circuit-To-Ground Voltage*: (Maximum Common Mode Voltage) 2865: 250 V DC between either input terminal and powerline ground

2866: −4.06 to +4.5 V DC between the common (−) input terminal and the power source common (5 V DC return)

(11) Conversion:

Technique:	Up-Down Integration
Rate:	2.5 samples per second, nominal

(12) Display:

Type:	7-segment, light-emitting diodes with 0.56″ high numerals
Number of Digits:	3 full digits plus overrange "1" digit
Polarity:	Automatic, with "−" indication; "+" indication implied
Out-of-Range:	All digits blank, except "1" digit
Decimal Point:	Fixed with range

(13) Power Requirements:

2865:	120, 220 or 240 V AC ±10%, 50 to 400 Hz, 6 VA
2866:	5 V DC, ±5% at 200 mA

(14) Temperature Range:

Operating:	0°C to +55°C
Storage:	−40°C to +60°C

(15) Relative Humidity: 0 to 85%, non-condensing

(16) Reference Conditions:

Temperature:	+23°C, ±2°C
Atmospheric Pressure:	575 to 800 mmHg
Relative Humidity:	30 to 60%

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*The maximum voltage, with respect to ground, which may safely and continuously be applied to the circuit of an instrument.

1.4 THEORY OF OPERATION

1.4.1 The basic block diagram of both Instruments is shown in Figure 1. The analog-to-digital conversion is accomplished by the Up-Down Integration technique. All A/D conversion circuitry is contained in an LSI integrated circuit. These Instruments convert an analog DC voltage at the input terminals into a corresponding digital value and polarity which are displayed in numeric form on the 7-segment light-emitting diode (LED) display. The particular current or voltage range is obtained by connecting the appropriate attenuator network to the input.

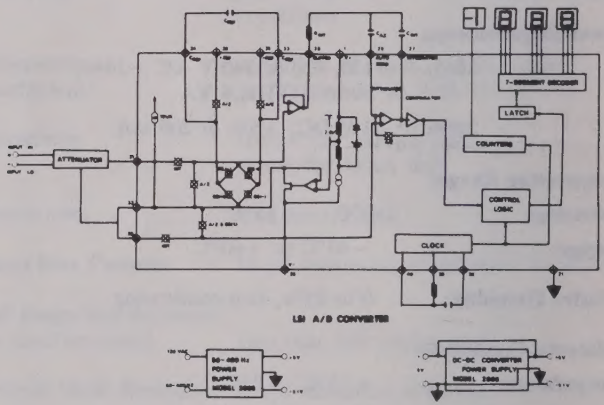

Figure 1. 2865 and 2866 Block Diagram

1.5 INSTALLATION

1.5.1 These Instruments can be mounted on panels ranging from 1/16 to 1/4 inches in thickness without any modification. To mount the Instrument, proceed as follows:

(a) Insert the Instrument through the front panel cutout.

(b) Insert a side mounting bracket (10-863122) on each side of the Instrument. Use the two holes near the bezel shown in Figure 2.

(c) Slide the brackets toward the rear of the slots until they lock in place.

(d) Turn the screws in each bracket until they firmly contact the panel surface.

CAUTION

Do not tighten the screws. Wait until both screws are snug against the panel surface, then tighten them. Do not over-tighten.

(e) Refer to Table 2 for power requirements. Check that the power source connector is connected to the correct terminals of the PC board connector. Also, be sure that the power source matches the label on the Instrument case. (Refer to paragraph 1.6 for connector wiring and grounding instructions.)

1.6 POWER SOURCE REQUIREMENTS AND CONNECTIONS

CAUTION

- **Do not attempt to connect the Instruments to a power source until instructed to do so. Check that the power designation on top of the case agrees with the power source to be used.**
- **When connecting multiple instruments to a common 5 V power source, DO NOT exceed the Rated Circuit-to-Ground voltage (2866 only). Refer to Table 1.**

1.6.1 The 2865 is wired at the factory for 120 volts AC operation (Table 2). For 220 or 240 volt operation, consult the nearest Authorized Simpson Representative. **For proper operation, be sure that the powerline ground connection of the 2865 is securely connected to a good earth (powerline) ground.** Preferably, use a standard 3-wire line cord and a 3-wire grounded outlet that conforms to the latest electrical code. All power connections are made to the PC board connector. The power requirement of the 2865 is approximately 5 V A. The 2866 is wired for 5 V DC operation, requiring approximately 200 mA.

1.6.2 2865 Power Connection: Check that the voltage rating on the label agrees with the source voltage to be used. Do not apply line power until all signal connections are completed.

1.6.3 2865 power connections are in accordance with Table 2.

1.6.4 2866 power connections (5 V DC) are in accordance with Table 2. Observe polarity when making these connections.

WARNING

These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

1.7 CASE AND FRONT COVER REMOVAL

WARNING

Remove all power and connections to the Instrument before removing the case or replacing the fuse.

1.7.1 The case and front cover can be removed for maintenance purposes as follows:

(a) Disconnect the Instrument from the AC power source (2865) or turn power OFF.

(b) Remove the two screws that attach the PC connector to the Instrument (when used) and remove the PC board connector from the rear of the Instrument.

(c) Remove the two screws that attach the front cover to the case and pull the PC board assembly forward out of the case.

1.8 LINE FUSE REPLACEMENT (2865 only)

1.8.1 The line fuse is located next to the power transformer.

(a) Remove the case and front cover as described in paragraph 1.7.

(b) Carefully lift the defective fuse from the holder and replace with a type 1/8A, 8AG, normal-blow fuse.

(c) Replace the case and front cover.

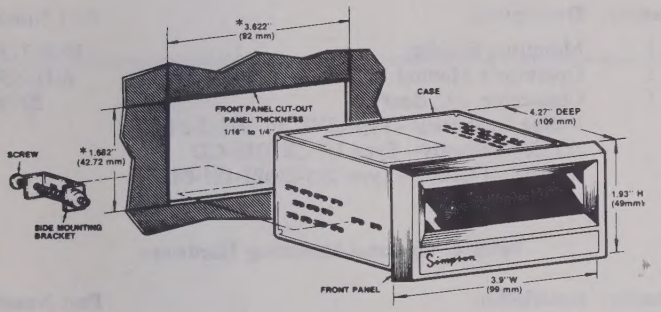

Figure 2. Panel Mounting and Cut-Out Dimensions

Table 2

CONNECTOR WIRING

PIN NO.	MODEL 2885	MODEL 2886
A	3rd wire ground	NC
B	NC	NC
C	120 VAC* LOW	NC
D	NC	NC
E	120 VAC* HIGH	NC
F	NC	+5VDC
H	Remote DEC. COM.	Remote DEC. COM.
J	DIGITAL COMMON	DIGITAL COMMON 5VDC RETURN
K	(D.P.3)	(D.P.3)
L	(D.P.2)	(D.P.2)
M	(D.P.1)	(D.P.1)
N	NC	NC
P	"–" INPUT COMMON	"–" INPUT COMMON
R	NC	NC
S	"+" INPUT	"+" INPUT

( ) Denotes Optional Decimal Point.

*Optional Connections for 220VAC or 240V Operation.

Figure 3. Rear Connector Pin Identification

Table 3. Items Supplied With the Instrument

Quantity	Description	Part Number
1	Mounting Bracket	10-863122
1	Operator's Manual	6-110954
1	Connector, PC Board Viking Industries—Type 2VK 15 D/1-2-34 US Components—Type UPCR-DIS-CD Amphenol Corp.—Type 225-21521-101-04	22990

Table 4. Optional Mounting Hardware

Quantity	Description	Part Number
1	Panel Adapter, DIN, IEC	22992
1	Panel Adapter, Domestic Type	22993
1	Mounting Bracket, Rear (DIN, IEC)	22991

DIGITAL INSTRUMENT
Warranty

SIMPSON ELECTRIC COMPANY warrants each digital instrument manufactured by it to be free from defects in material and workmanship under normal use and service, its obligation under this warranty being limited to making good at its factory any digital instrument which shall within one (1) year after delivery of such instrument or other article of equipment to the original purchaser be returned intact to it, or to one of its authorized service stations, with transportation charges prepaid, and which its examination shall disclose to its satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on its part, and SIMPSON ELECTRIC COMPANY neither assumes nor authorizes any other persons to assume for it any other liability in connection with the sale of its products.

This warranty shall not apply to any digital instrument which shall have been repaired or altered outside the SIMPSON ELECTRIC COMPANY factory or authorized service stations, nor which has been subject to misuse, negligence or accident, incorrect wiring by others, or installation or use not in accord with instructions furnished by the manufacturer.

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